

LEVERAGING INFORMATION SYSTEMS FOR FINANCIAL INCLUSION: A CASE STUDY OF bKASH IN BANGLADESH

By

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Declaration

It is hereby declared that

1. The Case Study submitted is my/our own original work while completing degree at BRAC University.
2. The Case Study does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The Case Study does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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Abstract/Executive summary

bKash, Bangladesh's leading mobile financial services (MFS) provider, serves over 70 million users, processing 2 billion transactions annually by 2023 (bKash, 2023). This case study examines how bKash leverages information systems to address scalability, cybersecurity, and e-commerce integration challenges to promote financial inclusion in a country where only 50% of adults had bank accounts in 2021 (World Bank, 2021). Key issues include rural transaction latency (60% 4G coverage), phishing vulnerabilities (15% user exposure), and low rural e-commerce adoption (10%) (GSMA, Bangladesh Bank). Proposed solutions involve edge computing, AI-based fraud detection, and logistics partnerships, grounded in systems theory, NIST framework, and digital platform theory (Laudon & Laudon, 2019; Parker et al., 2016). These strategies aim to enhance rural access, security, and digital commerce, ensuring bKash's mission to empower underserved populations.

Key Words

Financial Inclusion, Mobile Financial Services (MFS), Scalability and Cybersecurity, E-commerce Integration.

A. Introduction

In Bangladesh, where only 50% of adults had bank accounts in 2021 (World Bank, 2021), Mobile Financial Services (MFS) have surfaced as the most innovative in all aspects of financial incorporation. bKash was launched in 2021 as a subsidiary of BRAC Bank and has become one of the country's leading Mobile Financial Service providers, serving over 70 million users and processing 2 billion transactions annually by 2023 (bKash, 2023). This case study analyzes a crucial phenomenon: **How bKash leverages its information systems to label scalability and cybersecurity challenges in conveying financial inclusion?** Therefore, these challenges are of paramount to bKash's level of financial viability, since its transactions always handle huge transaction volumes as well as handling the expansion to access the underserved populations.

Some of these key issues, maintaining robust cybersecurity, verifying system scalability, and integrating with e-commerce platforms to enhance user agreements. Also, this case study applies theory from Computer Information Management (e.g., data analytic frameworks, and systems theory) and E-business (e.g., digital framework models) to access bKash's strategies and proposed solutions. The final outcome advocates that bKash's technology-driven approaches have revolutionized financial gain but encounter several running challenges in rural connectivity and regulatory consent.

B. Background.

Company Overview.

With its headquarter in Dhaka, bKash was founded to democratize financial services in Bangladesh, where low banking penetration and high mobile usage (90% penetration by 2023) created an opportunity for mobile-based solution (GSMA, 2023). It was initially a joint venture between BRAC Bank and Money in Motion LLC, but bKash later attracted investments from Ant Group and the Bill & Melinda Gates Foundation, hence, signing its global significance.

By

2023, bKash had employed over 3,000 staff and operated a network of 330,000 agents, enabling cash-in, cash-out, and digital transactions across urban and rural areas (bKash, 2023).

The Scene: A Slice of life.

In 2022, Fatima, a vegetable vendor in rural Sylhet market, used bKash to receive payments from customers and pay her suppliers, bypassing the need for a bank account. Her ability to save small amounts digitally via bKash's app transformed her financial security. However, during peak market hours, she occasionally faced transaction delays, and a recent phishing scam targeting her account raised concerns about security. Fatima's story reflects bKash's impact on financial inclusion and the scalability and cybersecurity challenges it must address to sustain trust and growth.

Some key Issues:

bKash's success depends on its information systems, which must scale to drive millions of day-to-day records while securing security counter to cyber threats. The company's amalgamation with e-commerce platforms such as Daraz further labors its infrastructure, requiring flawless transactions. These issues are pivotal because system pause or security breaches could be dilapidated user faith, while failure to scale limits bKash's capability to serve Bangladesh's increasing digital economy.

Research Context.

This case study depicts bKash's annual reports, industry analyses from **Global Mobile Telecommunication Association (GSM)**, and academic findings from ResearchGate. Key information discussions and interviews with bKash's **IT** staff provide technical details on system architecture and cybersecurity measures simulated from this case study, based on publicly available insights.

C. Evaluation of the Case Study.

The evaluation of bKash has the central points on the three key areas: Cybersecurity measures, Scalability of information, and E-commerce integration. All these concerns are crucial to bKash's capacity to prolong its role as Bangladeshi's key Mobile Financial Services (MFS) provider, leading more than 70 million customers and also enhancing 2 billion transactions annually (bKash, 2023). Each matter is explained into its complement, evaluated for effectiveness, and examined through theoretical bifocal from Computer Information Management (CIM) and E-business. This assessment portrays bKash's power in urban markets, reveals weaknesses in rural expansion, and underscores the interaction between technology and customers' trust and faith in financial inclusion.

Key Issues and Components

1. Scalability of Information Systems.

Component: The core of bKash's operations is its Transaction Processing System (TPS), a sophisticated network of servers, databases, and software designed to handle 2 billion transactions annually, equivalent to approximately 5 million transactions daily. The Transaction Processing System controls cash-in, cash-out, peer-to-peer transfers, and merchant payments, certifying real-time processing for many millions of customers.

Status: In urban areas like Dhaka and Chattogram, where 4G network connectivity is strong (85% coverage, GSMA, 2023), the Transaction Processing System performs effectively, with transaction accomplishment times averaging under 3 seconds. However, in rural regions which make up 40% of bKash's transactions, delaying concerns are still rampant. A user like Fatima, the Sylhet vendor, experiences slowdown during busiest hours, sometimes exceeding 15

seconds, interrupting business operation. Only 60% of rural areas had reliable 4G in 2023, and

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3G networks, still common in remote districts, struggled with bKash's data-intensive transactions (GSMA, 2023).

Why: The scalability problem emerges from two aspects. First, high transaction volumes pressurize server capacity, majorly during busiest periods like market days or Eid, where transaction points can exceed 7 million dailies. bKash's cloud-based servers, while scalable, depend on centralized data centers in urban centers, generating for rural users examining the system over fragile networks. Second, rural connectivity loopholes intensify miscommunication. The incompetent 3G/4G area coverage, integrated with weak bandwidth in remote areas, obstruct real-time transaction processing systems. This misposition between system inputs for example; server capacity, network infrastructure, and outputs such as transaction throughput jeopardizes bKash's ability to serve its emerging customer capacity.

Theoretical Lens: Systems theory, as articulated by Katz and Kahn (1978), provides a framework for understanding this issue. Systems theory predicts that organizations perform tasks as open systems, requiring balanced inputs like hardware upgrades and network enhancements, to process the desired outputs such as flawless transactions. For bKash's instance, the Transaction Processing System is an open system depending on outside factors like Bangladesh's telecom infrastructure. The theory spotlights the need for accommodative inputs; such as localized server solutions or network partnerships, to match the output requests of a nationwide Mobile Financial Service platform. The absence of these accommodations, the system risks volatility, exhibiting setbacks and customer dissatisfaction.

Deep Meaning: Cybersecurity in Mobile Financial Service is not just about securing data but safeguarding trusts, the core of financial services. For bKash, a single scam or breach can put off customers, especially in rural areas where trust in the digital world is pivotal. From a

Computer Information Management perspective, this issue underlines the significance of human-computer interaction in system design, requiring information technology managers to

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predict user behaviors. For E-business, it underlines the challenges of preserving customer conviction in digital transactions, a pivotal force of online commerce. The phishing problem also mirrors broader socio-economic challenges in Bangladesh, where digital inclusion surpasses digital literacy, necessitating innovative solutions like localized training and education campaigns.

2. Cybersecurity Measures.

Component: bKash's cybersecurity framework includes multi-factor authentication (MFA), requiring a Personal Identification Number and One-Time-Password for transactions and end-to-end encryption for data transmission. These measures protect user account and transaction data across its mobile app and USSD platform, used by feature phone users. **Status:** The cybersecurity measures are largely effective, preventing large-scale breaches securing 99.9% of transactions (bKash, 2023). However, vulnerabilities persist due to phishing and social engineering attacks targeting users. In 2022, 15% of bKash users reported phishing attempts, with 2% losing funds to scams (Bangladesh Bank, 2022). Rural users, with lower digital literacy, are particularly susceptible, as seen in cases where scammers pose as bKash agents to extract One-Time-Passwords.

Why: The loophole lies in consumers' education rather than technological protection. While bKash's encryption and Mobile Financial Service match with global standards, many users lack

awareness of phishing tactics. For instance, rural users like Fatima may face a gap compounded by

Bangladesh's low literacy rate (74% in 2023, UNESCO) and limited access to digital literacy programs. Without informed users, even robust systems remain vulnerable, as human error becomes the weakest link.

Theoretical Lens: The National Institute of Standards and Technology (NIST) Cybersecurity Framework (2014) emphasizes a holistic approach to security, integrating technology, processes, and people. NIST outlines user educational training as a critical component, believing that cybersecurity is only as strong as its human elements. In bKash's context, the framework highlights the need for proactive user education to complement Mobile Financial Service and encryption, ensuring a balanced security ecosystem.

Deep Meaning: Cybersecurity in Mobile Financial services S is not just about protecting data but safeguarding trust, the bedrock of financial services. For bKash, a single breach or scam can deter users, especially in rural areas where trust in digital platforms is fragile. From a Computer Information Management perspective, this issue underscores the importance of human-computer interaction in system design, requiring information technology managers to predict user behaviors. For E-business, it highlights the challenges of maintaining customer confidence in digital transactions, a core driver of online commerce. The phishing problem also reflects broader socio-economic challenges in Bangladesh, where digital inclusion outpaces digital literacy, necessitating innovative solutions like localized education campaigns.

3. E-commerce integration.

Component: bKash's Application Programming Interface (APIs) enable seamless integration with e-commerce platforms like Daraz and Pathao, allowing customers to pay for online purchases or delivery services directly through the bKash App. These Application Programming Interfaces manage several payment gateways, transaction verification, and refund processing, supporting Bangladesh's growing e-commerce sectors.

Status: In urban markets, e-commerce integration is a success, contributing to a 20% growth in e-commerce Gross Value Merchandise (GVM) in 2022 (bKash, 2023). Urban users leverage bKash for online shopping, bill payments, and ride-hailing, with 70% of Daraz transactions processed via bKash. However, rural penetration is low, with only 10% of rural users engaging in e-commerce (GSMA, 2023). Many rural vendors and consumers usually prefer cash-based transactions, and e-commerce logistics face last-mile delivery challenges. **Why:** Rural e-commerce adoption is hindered by two factors. First, cultural preferences favor cash, as rural users trust physical currency over digital payment for online purchases. Second, logistic infrastructure is weak, with 30% of rural areas lacking reliable delivery services (GSMA, 2023). These barriers limit bKash's ability to replicate its urban e-commerce success, despite its robust APIs. The lack of rural e-commerce growth restricts bKash's network effects, as fewer merchants and users join the digital ecosystem.

Theoretical Lens: Digital platform theory (Parker et al, 2016) explains this issue by emphasizing network effects, where a platform's value grows with its user base. For bKash, e-commerce integration succeeds in urban areas due to crowded user networks, but rural markets lack the critical mass of merchants and consumers needed for platform growth. The theory suggests that motivation and infrastructure investments are essentials to catalyze network effects in underserved regions.

Deep meaning: E-commerce integration is a backbone for bKash's evolution from a financial provider to a digital ecosystem authorize. By facilitating online commerce, bKash certify small businesses and consumers, matching with financial inclusion purpose. However, the big rural urban divide portrays a wider issue in E-business; scaling digital platforms in imploded marketplaces. From a Computer Information Management perspective, these issues demand smoother Application Programming Interface design and data compatibility, guaranteeing bKash integrates with diverse platforms. For E-business, it emphasizes the

desire for market development strategies that manages the cultural and logistic hinders transforming a cash-based economy into a digital economy.

4. Analysis.

Scalability: bKash's Transaction Processing System, built on cloud-based servers hosted in urban data center hubs, in a technological wonder, processing millions of transactions with minimum downtime. However, peak loads during festival seasons or market days push the system to its maximum, leading to many delays that interfere with user's needs. Rural connectivity, with only 60% 4G network coverage, intensifies this as transactions rely on a more stable internet connectivity. The 40% of transactions originating rurally points out the urgency of managing response time, as customers are bKash's growth frontier. Systems theory reveals that bKash's Transaction Processing System is out of stability, with inputs server capacity and

network bandwidth insufficient for outputs Bangladesh transaction processing. This malposition hampers user retention and bKash's competitive edge against rivals like Nagad.

Cybersecurity: bKash's encryption framework includes Multi-Factors Authentication (MFA), which requires the users to enter their Personal Identification Number and One-Time

Password for the successful transaction to complete. Therefore, this measure protects and secures the user's account and other transaction related activities. In 2022, 15% of bKash customers had reported very many phishing attempts, with 2% losing funds to scams (Bangladesh Bank, 2022). Rural users, with limited exposure to digital threats, are mostly targeted for scamming and, hence exploiting trust in bKash's brand. The NIST framework underscores that technology alone cannot ensure security; user behavior is equally critical. This loophole erodes communities from digital banking. These concerns also portray Bangladesh's large digital divide, where access to smartphones overtake cybersecurity awareness,

challenging bKash to bridge this loophole with more invention and innovation.

E-commerce Integration: bKash's Application Programming Interface is a trump for Computer Information Management, allowing real-time payment processing with platforms like Daraz, where 70% of transactions flow through bKash. This integration led to 20% Gross Merchandize Value growth in 2022, connecting bKash's role in urban e-commerce. However, rural markets, with only 10% e-commerce adoption, lag due to physical cash desires and logistics delays. Digital environment theory features that bKash's rural expansion joints on creating network effects, needing more customers, merchants, and delivery infrastructure. The real issues are not just technical but rural, demanding E-business strategies that transform mindsets from cash to digital payments. Without rural growth, bKash risks a two-tiered ecosystem, limiting its national impact.

D. List of Questions Central to this Case Study.

The following questions are prepared to explore bKash's challenges and coincide with Computer Information Management and E-business theories, establishing applicability to my academic background. Each question is contextualized, theoretically grounded, and designed to guide analysis and solutions.

1. Broad-Based Question (Computer Information Management):

Question: How can bKash optimize its transaction processing system to ensure scalability across urban and rural Bangladesh, balancing technological and infrastructural constraints?

Context: Scalability challenges emerge from high transaction volumes in urban areas but rural response time underlying consumer experience. The 40% rural transaction share and 60% 4G coverage highlight the urban-rural divide.

Theory: Systems theory (Katz & Khan, 1978) views organizations as dynamic systems requiring balanced inputs and outputs. For bKash, this means aligning server capacity and network infrastructure with transaction demands.

Relevance: This question engages Computer Information Management's core focus on designing and optimizing information systems, challenging an individual to address the real-world constraints in a developing economy of Bangladesh.

2. Focused Question (Computer Information Management):

Question: How can data analytics be leveraged to predict transaction bottlenecks in bKash's Transaction Processing System and allocate server resources dynamically to minimize latency?

Context: Analytics can identify peak load patterns (e.g., Eid spikes) and optimize resource allocation, reducing delays. bKash's 2023 report notes server upgrades but persistent rural

issues. **Theory:** Data-driven decision-making frameworks (Laudon & Laudon, 2019) highlight analytics in Management Information Systems, enabling proactive system management. **Relevance:** This question ties to Computer Information Management's expertise in data management, showcasing how analytics can enhance system performance in Mobile Financial Service.

3. Broad-Based Question (E-business):

Question: What strategies can bKash employ to enhance its e-commerce integrations and drive adoption in rural Bangladesh, overcoming cultural and logistical barriers? **Context:** Rural e-commerce adoption is stalled at 10%, limited by cash preferences and weak logistics, despite robust urban Application Programming Interface integrations (GSMA, 2023). **Theory:** Digital platform theory (Parker et al., 2016) focuses on network effects, where platform value grows with user merchants' engagement. Rural expansion requires incentives and infrastructure.

Relevance: This question aligns with E-businesses focus on digital commerce, addressing market development in underserved regions strategies.

4. Focused Question (E-business):

Question: How can bKash use digital marketing strategies to build user trust in its cybersecurity measures, reducing phishing vulnerabilities?

Context: Phishing affects 15% of users, eroding trust. Proactive communication can educate users and reinforce bKash's security commitment.

Theory: Kotler's marketing mix (Kotler & Keller, 2016) emphasizes promotion as a tool for customer engagement, critical for addressing trust deficits.

Relevance: This question leverages E-business's marketing experience, applying it to a critical Mobile Financial Service challenge

E. Proposed Solutions and Changes:

Solutions:

1. Scalability Enhancement:

Solution: Deploy edge computing node to process transactions locally in rural areas, reducing reliance on urban data centers. This can be complemented with upgrading cloud infrastructure, including load balancers to distribute traffic during peak loads.

Rationale: Edge computing minimizes reliance on central servers, while load balancers distribute traffic efficiently (Laudon & Laudon, 2019). GSMA (2023) notes that edge computing is viable for MFS in developing countries, cutting delays by up to 30%. Load balancers, as per Laudon and Laudon (2019), ensure efficient traffic management, enabling bKash to handle 3 billion transactions annually. This dual approach aligns with system theory, balancing inputs both the local and cloud infrastructure with outputs which result in flawless transactions.

2. Cybersecurity Improvement:

Solution: Launch a multiple user education campaign via SMS, app notifications, and community workshops to teach phishing prevention. Integrate AI-based fraud detection to monitor transactions in real-time, flagging suspicious activities.

Rationale: NIST (2014) empathizes with user training as a cybersecurity pillar, critical for bKash's low-literacy user base. SMS campaigns are effective in Bangladesh, reaching 90% of mobile users (GSMA, 2023). AI detection, which reduced fraud by 30% in similar MFS platforms (McKinsey, 2023), enhances proactive security. These measures address the human

element, strengthening bKash's security ecosystem.

3. E-commerce Expansions:

Solution: Partner with local logistics providers such as Pathao to improve last-mile delivery in rural areas. Offer incentives, such as a 5% cashback on e-commerce transactions, to encourage rural adoption.

Rationale: Digital platform theory (Parker et al., 2016) suggests incentives drive network effects. Daraz's rural expansion increased GMV by 15% with similar strategies (Daraz, 2023). Logistics partnerships address last-mile challenges, critical for rural e-commerce growth. This strategy transforms bKash into a rural e-commerce enabler, expanding its ecosystem.

Supporting Evidence:

Scalability: bKash's 2023 report highlights server upgrades but notes rural latency issues, supporting the need for edge computing. GSMA's data on 60% rural 4G coverage underscores connectivity gaps.

Cybersecurity: Bangladesh Bank's 2022 data on phishing incidents around 15% user exposure underscores user education gap, supporting the campaign proposal. McKinsey's Artificial Intelligence success in Mobile Financial Service reinforces fraud detection's efficacy. **E-commerce:** GSMA (2032) reports that rural e-commerce adoption lags due to logistics, while Daraz's cashback success provides a blueprint for bKash's incentives.

F. Recommendations/Conclusions.

Specific Actions:

1. Scalability:

Deploy edge computing nodes in 10 rural districts by Q2 2026, costing \$5 million but reducing latency by 20%as projected. This leverages local processing to bypass connectivity gaps. Implement load balancers by **Q1 2026**, with a \$2 million investment, to handle 3 billion transactions annually, ensuring rural and urban scalability.

2. Cybersecurity:

Launch nationwide Short Message Service and app-based education campaign by **Q4 2025**, reaching 50 million users at \$500,000. Tailored to low-literacy audiences, it will reduce phishing by 10%. Also, Integrate Artificial Intelligence fraud detection by **Q3 2026**, with a \$1 million investment, targeting a 25% reduction in fraud incidents, enhancing user trusts.

3. E-commerce:

Partner with Pathao for rural logistics by **Q3 2026**, with a worth a \$3 million investment, to cover 20 districts, improving last-mile delivery for e-commerce. In addition to this, offer 5% cashback on rural e-commerce transactions, budgeted at \$1 million, to boost adoption by 10%, driving network effects.

Alternative Actions.

Action	Cost	Consequences	Impact

Alternative Scalability: Use satellite internet for rural connectivity.	\$10M	High cost, slower deployment.	Long-term rural access but delays implementation.
Alternative Cybersecurity: Outsource fraud detection to third-party vendors.	\$800K	Faster setup, less control.	Short-term gains but risks data privacy.
Alternative E-commerce: Focus on urban e-commerce expansion.	\$1.5M	Higher immediate ROI.	Neglects rural inclusion goals.

Evaluation:

Edge Computer versus Satellite: Edge computing is more cost-effective and faster to deploy, aligning with bKash's immediate scalability needs. Satellites' high cost and complexity delay rural impact.

AI Detection versus Outsourcing: In-house Artificial Intelligence ensures data control, critical for trust in Mobile Financial Service. Outsourcing risks privacy breaches, undermining bKash's reputation.

Rural versus Urban E-commerce: Rural vision supports financial inclusion, bKash's core mission, despite lower short-term Return on Investment to serve the underserved population.

Future Actions:

Monitor 5G rollout in Bangladesh (expected by 2027) to enhance rural TPS performance and connectivity.

Expanding user education to include video tutorials, addressing low literacy rates, hence leveraging bKash's app.

Exploring blockchain for transparent transaction records, strengthening trust and auditability.

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